Muhlenberg County Water District
P. O. BOX 348
GREENVILLE, KENTUCKY 42345

March 26, 2013

To: George Wakim
Re: Bidding of I-Pearl Meters

As per our phone converstion about purchase of drive-by meters we have enclosed literature of bids from C.I. Thornberg as well as spec sheets. We originally went with C.I. Thornberg because they were the only representative for I-Pearl Meters in the tri-state area. We have 3 different bids-$1,499,200.00 on June 2009, then $1,322,400.00 on July 2012, and finally 1,247,000.00 which will expire on July 2013 that are a result of price negotiation and SR II meters having been priced higher due to low lead which we have been informed price will only increase in future quotes.I-Pearl was also our choice due to it having better technology. Finally, we chose to purchase all meters up front because in the price negotiations, $100,000 was taken off purchase price.

Sincerely,

Davey Douglas, Superintendent

SPECIFICATIONS

Water Meter and Radio Reading System Specification

Residential Meters

Type
Solid state, battery operated electromagnetic flow measurement system with a hermetically sealed, glass covered, electronic register with a programmable 9-digit display.

Conformance to Standards
The Meter must conform to American Water Works Standard C-700 and C-710 as most recently revised with respect to accuracy and pressure loss requirements, or other appropriate American Water Works Standard. Meter shall be compliant with ANSI/NSF Standard 61 Annex G.

Register
The register must be an electronic device encapsulated in glass with 9 programmable digits utilizing a liquid crystal display (LCD). It will have indicators for flow direction, empty pipe, battery life and unit of measurement. The register must be hermetically sealed with a heat tempered glass cover and be tamper resistant. The register shall not be removable from the measuring sensor. The register shall utilize a magnetic coupling technology to connect to a touch read, radio read or fixed base meter reading system in either an inside or pit set installation. The electronic register shall have internal data logging capability and alarm status messaging to include reverse flow, tamper detection, empty pipe, leak detections, and battery status.

Measuring Element
The measuring element shall be made of a noncorrosive, lead-free glass fiber reinforced, PPS (polyphenylene sulfide) based resin. A battery powered magnetic flow sensor utilizing silver/silver chloride electrodes will be utilized to measure the velocity of the water which is linearly proportional to the volume. The measuring element will have no moving parts and will be specific for each size. The low flow accuracy shall be no more than 0.03 gpm.

External Housing
The register and measuring element will be an integrated unit housed within a thermal plastic external casing. This integrated unit will not be removable from the external housing. The systems shall have the size and direction of water flow through the system imprinted on the external housing.

Accuracy and Headloss Tests
Systems shall conform to current AWWA C-700 and C-710, current revision, or other appropriate American Water Works Standard, test flows, head-loss and accuracy standards.

Pressure Capability
System shall operate up to a working pressure of 200 pounds per square inch (psi), without leakage or damage to any parts. The accuracy shall not be affected by variation of pressure up to 200 psi.

Performance Warranties
In evaluating bid submittals, warranty coverage will be considered. All bidders are required to submit their most current nationally published warranty statements for water meter maincases, registers and measuring chambers.

Manufacturer
Meter shall be the Sensus iPERL as manufactured by Sensus Metering Technologies. Uniontown, PA, or written acceptable equal

Radio Reading System Overview

- The radio reading system must utilize the strongest transmitting interfaces available so that system performance is maximized.
- The radio reading system interfaces and batteries must be backed by a 20 year published warranty.
- The radio reading system must allow for reading of meters by a touch pad connection, by a handheld device, or by a vehicle based system that is portable and not dedicated to a specific vehicle.

General
The following specification describes the requirements for a radio based automatic meter reading system. The specification will cover the meter transceiver unit (MXU). If meters and other supporting equipment are included in this proposal or bid, they will be covered under separate specifications.

Radio System Description
The radio AMR system will have the ability to read meters equipped with absolute encoder registers using either a hand-held interrogation unit or a mobile interrogation unit. The encoder registers will be connected to a MXU that will provide the radio link from the meter to the interrogation unit.

The radio AMR system must utilize a true two-way (interrogate and respond) communication protocol that enhances system integrity and reliability.

Upon completion of the meter reading route, the meter reading data is downloaded from the interrogation unit, using the radio AMR software. The radio AMR software will prepare and format the meter reading data for the printing of selected management reports and the transfer of the meter reading data to the billing software for customer invoicing.

Meter Transceiver Units (MXUs)

Function

The MXU will be the interface between the meter and the radio interrogation unit. The MXU will power up when a valid alert signal is received from the reading interrogation unit. The interrogation unit will be either a hand-held or vehicle mounted device. The MXU and interrogation device will utilize a two-way communication protocol. Following the alert signal from the interrogation unit and transmission of meter reading data, the interrogation unit will signal to the MXU that valid reading parameters were met and will instruct the MIU to power down.

The MXU must have the capability of utilizing a reading cycle code which is an element of the transmission protocol. The reading cycle code is utility controlled and changes with each reading cycle. Once an MXU has been successfully interrogated and powered down using a specific reading cycle code, the MXU will not alert again until the code is changed.

The MXU will have a fixed factory set non-programmable identification number to insure absolute identity of the MXU within the radio AMR system.

In addition, the MXU will have the capability of storing a utility defined programmable class code. The class code will be used to separate different classes of meters and differentiate the MXU in multi-utility installations.

FCC Regulations

All equipment must comply with current Federal Communications Commission (FCC) requirements which include proper labeling of the MXU. The bidder must have supporting documentation available upon request to verify compliance.

Modulation

The Meter Transceiver shall transmit on a Primary-Licensed Narrow band FCC frequency. The Meter Transceiver shall be a high-power (transmitting at up to two watts), two-way communication device that is available in both wall and pit

mount configurations. The Meter Transceiver must also be available in configurations that can incorporate up to two meters.

Hardware
The MXU will be housed in a two-piece UV stable molded plastic housing. The enclosure must house the complete two-port MXU unit which includes electronics, battery compartment, and wire connections. The MXU will also have an internal antenna. The housing must have the option of being wall mounted or mounted in an underground meter box. Any special mounting hardware should be supplied with the MXU. The enclosure will provide protection for the electronic components and wire connections and be capable of being submersed in a water filled meter box without damage.

The MXU must have a field replaceable battery cartridge. The battery will be used in conjunction with a hybrid layer capacitor to insure longevity. The battery cartridge must be date stamped for ease of age identification for warranty purposes.

MXUs must use the following features to maximize system performance:

- MXU must operate in a **2-way** mode of communication to maximize transmission power and increase battery life.
- MXUs must transmit at **2 watts** to maximize performance.
- MXUs must have a battery that is easy to replace in the field.
- MXU and battery must be backed by a **20 year published warranty**.
- MXU must be able to connect to a touch pad for reading flexibility.
- The MXU must not transmit meter reading information at programmed intervals so that battery life is increased.
- The MXU should have the ability to be programmed with codes that allow the system to be segmented.
- Pit-set MXU should feature high density polyethylene electronics enclosures. Pit-set MIUs should not require pit lid modification during installation, but should have the ability to be mounted through the lid if desired.
- The MXU battery is activated during installation and MXU programming.
- No gel-capping or wire connections are necessary for pit-set installations. The pit-set installations will be completely potted with NO need for wiring

connections during installation. The MXU should be completely sealed including the battery. All electronics, antenna and battery should be connected at the factory and permanently sealed in a high-density polyethylene (HDPE) enclosure.

- The pit-set MXU will connect with the waterproofed and potted register. The waterproofed meter register should have a factory permanently and hermetically sealed waterproof design, with factory pre-wired and potted terminal screw area. The register must be impervious to water due to the use of an internal moisture barrier, a design that allows no moisture penetration. The pit-set register wire must end in a factory-potted and sealed sensor that will snap connect directly to the MXU. Information should pass between register and MXU through an inductive coupling and no wire connections are necessary. All components for pit-setting must be potted and only require a snap connection in the field.

- Non-pit MXU s should have the ability to connect with the non-pit registers either by hard wire, or by a user selected retrofit kit with touch type pads. The information will be passed between meter and MXU through an inductive coupling when interfacing with existing touch type pads.

- The non-pit set MXU must have potted and sealed electronic components and batteries.

- Non-pit MXU must have field replaceable batteries.

MIU Performance Warranties

As a minimum, the electronics shall be warranted for twenty (20) years from date of shipment for defects in materials and workmanship. Battery warranty shall be twenty (20) years from date of factory shipment. Warranties should be published, and available nationwide.

Manufacturer

Meter transceiver units shall be Sensus Model 520P as manufactured by Sensus Metering Technologies , Uniontown, PA.

Hand Held Reading Device (HHRD)

The HHRD shall feature the following items to maximize system performance?

- The HHRD must transmit an alert signal to specific MXU s that are contained on the route file. Once the signal is received by the MXU it will transmit an actual reading to the HHRD.

- The HHRD must be used to obtain meter readings via manual key entry, touch pad, or from radio read MIUs. Reading information must be transferred between HHRD and the utility computer and billing software.

- The HHRD must have the ability to be loaded with multiple meter reading routes along with MIU and water meter register programming software so that HHRD operating flexibility is maximized.

- The HHRD must not utilize externally attached antennas, or radio read transmitters/receivers so that HHRD durability is maximized.

System Requirements

1. System will collect and store meter readings automatically utilizing a manual entry by use of a keypad, utilizing a "touch" device for remote reading, or by wireless connection to a reading gun. All meter readings will be captured in the meter reading device for later analysis including multiple data entries and bad readings.

2. The system will be fully programmable with route information, meter reader prompts and questions. "High/Low" checking must be provided for on both "touch" and manually entered readings.

3. The system must provide for bi-directional communications with both the Utility's mainframe computer and an IBM-PC or fully compatible personal computer by utilizing a communications/charging stand. The vendor shall describe all personal computer hardware, software and peripheral devices which are necessary for the operation of the proposed system. The technical specifications, model numbers, etc. of the personal computer equipment proposed shall be provided. The Utility reserves the right to substitute an equivalent personal computer and peripheral devices which it may presently own or may purchase from a vendor of the Utility's choosing.

4. The software which is proposed for use on the personal computer must be suitable for use by a non-technical operator. Accordingly, the software shall be fully menu driven which will substantially eliminate the need for the operator to be familiar with other than basic operational procedures. The software must also provide for customer select management reports related to the data of the meter route read.

5. The proposed equipment shall be suitable for a traditional field meter reading environment. Such features shall include but not be limited to the following:

-Alpha-numeric keypad

-Durable weatherproof housing
-10-line x 20 character per line displays
-Backlighted displays and keypad
-Field adjustable contrast displays
-Elastomeric membrane, tactile response keypad
-Weigh less than three pounds (26 oz.)
-Field adjustable audible tone
-2-4 megabyte of memory
-Durable carrying belt with handstrap
-Watertight gun connectors
-Compatible to read Sensus And Neptune ProRead Meters
-Meter reader ID password
- Function Keys

6. Each meter reading device shall include sufficient memory to store at least 3000 readings before the need to download data. Memory must have full battery protection. Internal hardware and software data check are required to verify the integrity of the collected data.

7. The meter reading device must include a full function alphanumeric keypad which will be utilized by the non-technical meter reading personnel for manual entry of readings from conventional meters as well as the entry of special notes. Readings from meters not on the pre-defined route must be provided for.

8. Each meter reading device must be powered by a long life, light weight, field replaceable, nickel cadmium (NiCad) battery pack. The battery pack must be capable of supporting multiple days' readings without the need to recharge. The field units must be recharged while resting in the communication/charging stand. A meter reading device which is placed in the stand at the end of the working day must be fully charged prior to the beginning of the next working day. The field devices must provide for protection of the stored data should the NiCad battery pack fail to provide power. Each meter reading device must be equipped with its own charging stand and not require any special pin connections.
9. Successful meter readings must be confirmed by a loud, audible tone and similarly alert the operator in the event of a faulty or missed reading. The devices shall provide for a programmable audible warning for a potentially dangerous or special situation which may be associated with a particular meter location. The volume of the audible tone must be user adjustable.

10. The meter reading device must be equipped with a date and time-of-day clock which will automatically incorporate the date and time of reading into each "touch" or manual reading.

11. The software will provide, at the user's option, forward or reverse movement through the route.

12. The successful bidder shall provide full and complete hardware and software documentation which shall include but not be limited to operator manuals which are designed for use by non-technical users as well as detailed technical manuals which are designed for use by technical support and programming personnel.

Vehicle Based Reading Device (VBRD)

The VBRD must use the following items to maximize system performance:

- The VBRD must transmit an alert signal to large groups of MXUs, or to specific MXUs, that are contained on the route file. Once the signal is received by the MXU it will transmit an actual reading to the VBRD.

- The VBRD must have the ability to accept manual or touch pad meter readings, note codes and other route information as manually entered by the meter reader. Read information must be transferred between the VBRD computer and the utility computer and billing software.

- The VBRD must have the ability to utilize a Global Positioning System (GPS) along with a map of the utility system. The map will display meter locations and their status as the meter reading progresses through the system.

VBRD Basic Functions

The VBRD is considered the complete package that will permit the utility to read meters by using any vehicle in the utility's fleet via radio signals.

The complete VBRD package, as a minimum, will include the following:

- A laptop computer connected to the VBRD with the capability to handle multiple reading of radio equipped meters and the storage of meter reading data

- VBRD radio operating software

- A magnetic mount antenna that connects to the VBRD for optimal radio reading performance

- A power cable capable of plugging into a 12-volt cigarette lighter to power the VBRD

- Applicable connector cables for the computer and VBRD

- Carrying case for all VBRD equipment

The VBRD will have the capability to collect and store meter readings at any time on the meter reading route via radio transmission with any meter equipped with an encoder and MXU.

The VBRD will send an alert signal to a MXU connected to a meter fitted with an encoder register. Upon receipt of the alert, the MIU will transmit the meter reading data to the VBRD. Once this data is received and if all parameters are valid in the meter reading message, the VBRD will acknowledge the MXU that the data is valid and permit the MXU to go into a power down mode. The VBRD will be able to handle multiple readings from MIUs simultaneously.

The VBRD software will periodically transfer the meter reading data to the hard drive of the VBRD computer to maintain already read meters in case of power failure. The VBRD computer will also have its own battery in case of vehicle power system failure.

The VBRD will provide the capability to read the MXUs in either a geographic mode or blind mode. Geographic mode being the ability to alert and receive transmission for a specific MXU or group of specified MXUs. In the blind mode, the VBRD will be able to alert and receive transmission from any MXU within range of the alert signal simultaneously.

The VBRD shall also have the capability to address MXUs on a wild card alert basis. The wild card will be operator controlled from the VBRD.

The VBRD, in conjunction with the MXU will have the capability of utilizing a reading cycle code within the transmission protocol. The reading cycle code is utility controlled and changes with each reading cycle. Once an MXU has been successfully interrogated and powered down using a specific reading cycle code parameter, the MXU will not alert again until the code is changed.

For optimum performance, the VBRD will have the capability to analyze noise levels of applicable RF channels in the area and select the optimum frequency for the MXU to transmit. It will then command through the alert signal to the MXU what frequency to transmit the meter reading back to the VBRD.

The VBRD shall be able to function either with or without a meter reading route. With a reading route, the VBRD will be able to read the meters in either blind or geographic reading mode and post the readings to the proper account through the use of the MXU and encoder register identification number. Without a reading route, the VBRD will be able to read the meters in either blind or geographic reading mode. The VBRD will retain the meter readings for later posting to the billing software by matching with the proper account through the use of the MXU and encoder register identification number.

The VBRD software will have the capability to address MXUs in conjunction with the MXU class code option which is an optional utility defined code programmed into the MIU for meter reading.

VBRD Data Transfer
The VBRD will be able to store the meter reading data either on the hard disk of the laptop computer or on a diskette of the computer disk drive. If stored on the computer hard drive, the meter reading data will be able to be transferred to the computer interfacing to the billing software through file transfer to a diskette. The VBRD computer will also have the capability to be directly linked to the interfacing computer for computer to computer transfer. The VBRD computer will have a programmable baud rate capability for the computer transfer.

VBRD Power Requirements
The VBRD will be powered from any vehicle in the utility's fleet that has a 12-volt power system. The VBRD computer will have its own battery for backup in case of the vehicle system failure. The backup battery will be able to operate the VBRD computer for at least two (2) hours with a fully charged battery.

VBRD Navigation System
The VBRD will provide for an optional navigation system. The VBRD design will permit a commercially available GPS receiver to be interfaced to the VBRD via a USB link.

Installation and Training
Complete installation and operating instructions must be included for all of the supplied hardware and software equipment. Proposal must include any additional costs for training and assistance to install and begin operation of the MIUs. The vendor will also inform the customer what pre-installation activities are to be completed and what support materials will be needed for the initial installation.

Loaner Equipment
Loaner reading equipment shall be available on a 48 hour basis from either the manufacturer or its local representative should the utility's equipment need repair. The loaner equipment will be made available to the utility at no charge and may be used until the utility's repaired equipment is returned.

Manufacturer

Electronic reading equipment and software shall be the following

Handheld reading devices shall be Sensus model 5001/ 5002 as manufactured by Sensus Metering Technologies, Uniontown, PA

Vehicle based reading equipment shall be Sensus Vehicle Gateway Basestation (VGB) as manufactured by Sensus Metering Technologies, Uniontown, PA

Route reading and management software shall be Sensus Autoread and AutoVu with mapping as manufactured by Sensus Metering Technologies, Uniontown, PA

SPECIFICATION

Residential Electromagnetic Meter 5/8" through 1"

Type

Meter shall be solid state, battery operated electromagnetic flow measurement system with a hermetically sealed, glass covered, electronic register with a programmable 9-digit display.

Conformance to Standards

The Meter must conform to American Water Works Standard C-700 and C-710 as most recently revised with respect to accuracy and pressure loss requirements. Meter shall be compliant with ANSI/NSF Standard 61 Annex G & F

Register

The register must be an electronic device encapsulated in glass with 9 programmable digits utilizing a liquid crystal display (LCD). It will have indicators for flow direction, empty pipe, battery life and unit of measurement. The register must be hermetically sealed with a heat tempered glass cover and be tamper resistant. The register shall not be removable from the measuring sensor. The register shall utilize a magnetic coupling technology to connect to a touch read, radio read or fixed base meter reading system in either an inside or pit set installation. The electronic register shall have internal data logging capability and alarm status messaging to include reverse flow, tamper detection, empty pipe, leak detections, and battery status.

Measuring Element

The measuring element shall be made of a noncorrosive, lead-free glass fiber reinforced, PPS (polyphenylene sulfide) based resin. A battery powered magnetic flow sensor utilizing silver/silver chloride electrodes will be utilized to measure the velocity of the water which is linearly proportional to the volume. The measuring element will have no moving parts and will be specific for each size. The meter operating range shall be 0.03 gpm (0.007 m3/hr) @ 95% minimum to 55 gpm (12.5 m3/hr) @ 100% ± 1.5% registration of actual throughput.

External Housing

The register and measuring element will be an integrated unit housed within a thermal plastic external casing. This integrated unit will not be removable from the external housing. The systems shall have the size and direction of water flow through the system imprinted on the external housing.

Accuracy and Headloss Tests

Systems shall conform to current AWWA C-700 and C-710, current revision, or other appropriate American Water Works Standard, test flows, head-loss and accuracy standards. The meter shall not exceed the below listed headloss

5/8" (DN 15mm) size: 4 psi at 15 gpm (0.3 bar at 3.4 m3h)
3/4" (DN 20mm) size: 2 psi at 15 gpm (0.1 bar at 3.4 m3h)
1" (DN 25mm) size: 2 psi at 25 gpm (0.1 bar at 5.7 m3h)

Pressure Capability

System shall operate up to a working pressure of 200 pounds per square inch (psi), without leakage or damage to any parts. The accuracy shall not be affected by variation of pressure up to 200 psi.

Performance Warranties

In evaluating bid submittals, warranty coverage will be considered. All bidders are required to submit their most current nationally published warranty statements for water meter maincases, registers and measuring chambers. The meter shall have new meter accuracy warranty for 20 years as stated in published documentation.

Manufacturer

Residential water meters shall be of the electromagnetic technology with no moving parts and shall be manufactured by Sensus Metering Technologies or written approved equal.

iPERL™ Water Management System

Electromagnetic Flow Measurement System

5/8" (DN 15mm), 3/4" (DN 20mm) and 1" (DN 25mm) Sizes

DESCRIPTION

MODEL: With no moving parts, the Sensus iPERL water management system is based on innovative electromagnetic flow measurement technology. The iPERL system family has an operating range of 0.03 gpm (0.007 m^3/hr) @ 95% minimum to 55 gpm (12.5 m^3/hr) @ 100% ± 1.5% registration of actual throughput.

CONFORMANCE TO STANDARDS: The iPERL system far exceeds the most recent revision of ANSI/AWWA Standard C-700 and C-710 for accuracy and pressure loss requirements. All iPERL systems are NSF Standard 61 Annex G compliant and tested to AWWA standards.

PERFORMANCE: The patented measurement technology of the iPERL system allows enhanced accuracy ranges at both low and high flows and perpetual accuracy over the life of the product as well as the full measurement range.

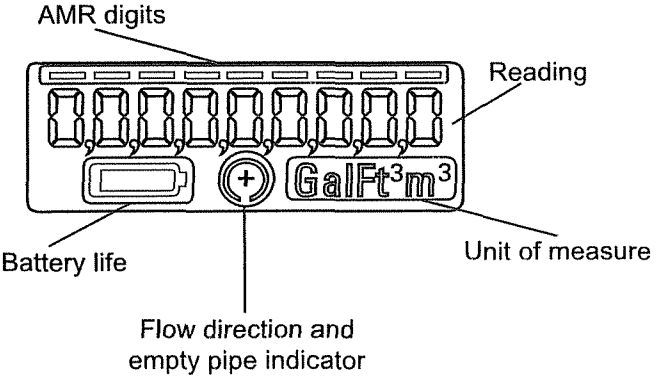
CONSTRUCTION: The iPERL system is an integrated unit that incorporates an electronic register and measuring device encased in an external housing. The measuring device is comprised of a polyphenylene sulfide alloy flowtube with externally-threaded spud ends. Embedded in the flowtube are magnetic flow sensors and a replaceable strainer screen. The all electronic programmable register is hermetically sealed with a tempered glass cover. The iPERL system has a 20 year life cycle, along with a 20 year battery life guarantee. At the end of this life cycle, you do not have to be concerned about repairing the iPERL system since the design is not meant to be repaired but is easily replaceable.

ELECTRONIC REGISTER: The high resolution 9-digit hermetically sealed electronic register with LCD display was designed to eliminate dirt, lens fogging issues and moisture contamination in pit settings with built in tamper protection. The tempered glass register cover displays readings with the AMR digits highlighted. Direction of flow and units of measure are also easily readable on the register display. The register is programmable using the UniPro programming package to display in either gallon, cubic feet or cubic meter totalization. The large, easy to read display also includes battery life and empty pipe indicators.

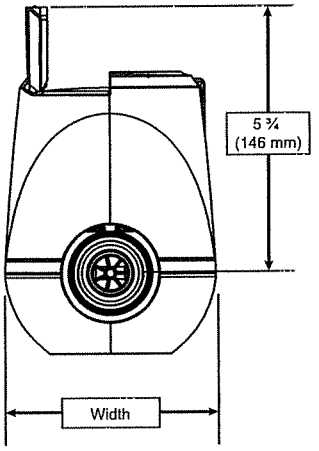
TAMPERPROOF FEATURES: The ingenious integrated construction of an iPERL system prevents removal of the register to obtain free water. The magnetic tamper and low field alarms will both indicate any attempt to tamper with the magnetic field of the iPERL system.

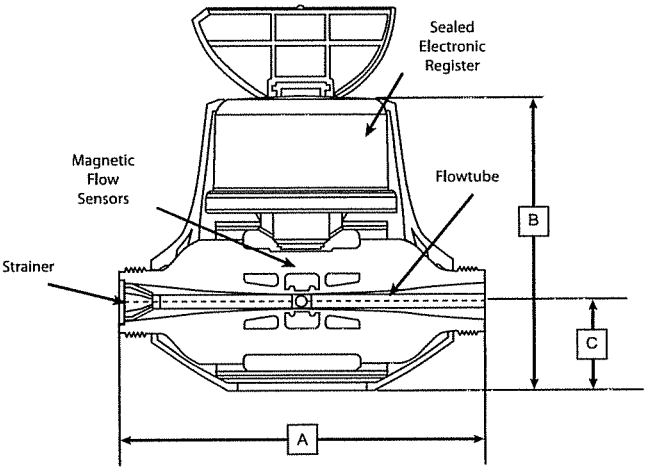
AMR/AMI SYTEMS: iPERL systems are compatible with current Sensus AMR/AMI systems.

Electronic Register LCD Display



Technology for the iPERL system is licensed from Sentec Limited.





DIMENSIONS AND NET WEIGHTS

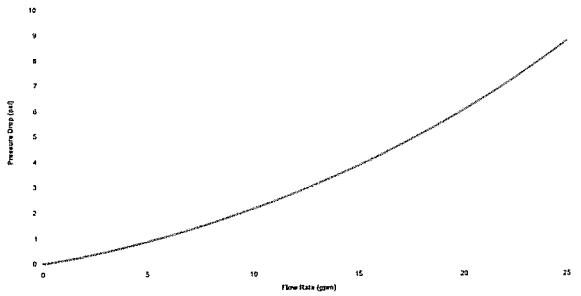
Size	A (lay length)	B	C	Spud Ends	NPSM Thread Size	Width	Net Weight
5/8" (DN 15 mm)	7-1/2" (190 mm)	6-1/10" (155 mm)	1-3/4" (44 mm)	5/8" (15 mm)	3/4" (19 mm)	4-1/2" (114 mm)	3.1 lb. (1.4 kg)
3/4"S (5/8" x 3/4") (DN 20 mm)	7-1/2" (190 mm)	6-1/10" (155 mm)	1-3/4" (44 mm)	3/4" (20 mm)	1" (25 mm)	4-1/2" (114 mm)	3.1 lb. (1.4 kg)
3/4" (DN 20 mm)	9" (229 mm)	6-1/10" (155 mm)	1-3/4" (44 mm)	3/4" (20 mm)	1" (25 mm)	4-1/2" (114 mm)	3.2 lb. (1.5 kg)
1" (DN 25 mm)	10-3/4" (273 mm)	6-1/10" (155 mm)	1-3/4" (44 mm)	1" (25 mm)	1-1/4" (32 mm)	4-1/2" (114 mm)	3.3 lb. (1.6 kg)

SPECIFICATIONS

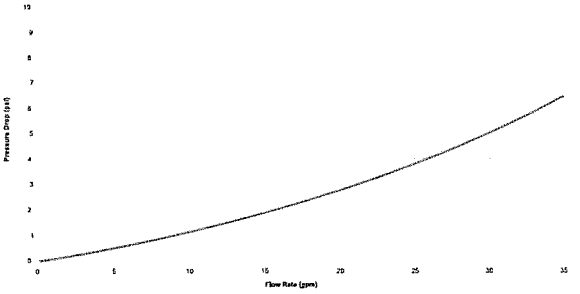
SERVICE	Measurement of cold water with flow in one direction only.
NORMAL OPERATING FLOW RANGE (100%±1.5% of actual throughput)	5/8" (DN 15mm) size: 0.11 to 25 gpm (0.02 m^3h to 5.7 m^3h) 3/4" (DN 20mm) size: 0.11 to 35 gpm (0.02 m^3h to 8.0 m^3h) 1" (DN 25mm) size: 0.4 to 55 gpm (0.09 m^3h to 12.5 m^3h)
LOW FLOW REGISTRATION (95%-101.5%)	5/8" (DN 15mm) size: 0.03 gpm (0.007 m^3h) 3/4" (DN 20mm) size: 0.03 gpm (0.007 m^3h) 1" (DN 25mm) size: 0.11 gpm (0.025 m^3h)
MAXIMUM PRESSURE LOSS	5/8" (DN 15mm) size: 4 psi at 15 gpm (0.3 bar at 3.4 m^3h) 3/4" (DN 20mm) size: 2 psi at 15 gpm (0.1 bar at 3.4 m^3h) 1" (DN 25mm) size: 2 psi at 25 gpm (0.1 bar at 5.7 m^3h)
MAXIMUM OPERATING PRESSURE	200 psi (13.8 bar)
MEASUREMENT TECHNOLOGY	Solid state electromagnetic flow

REGISTER	Hermetically sealed, tempered glass covered 9-digit programmable electronic register AMR/AMI compatible iPERL system register programmable using the UniPro programming package iPERL systems are shipped in active mode
MATERIALS	External housing – Thermal plastic Flowtube – Polyphenylene sulfide alloy Electrode – Silver/silver chloride Strainer – Synthetic polymer Register cover – Tempered soda lime glass
ALARM DEFAULTS	Alarm Duration – 90 days Leak Duration – 24 hours Datalog Interval – 1 hour Alarm Mask – All alarms reported History Mask – All event types reported

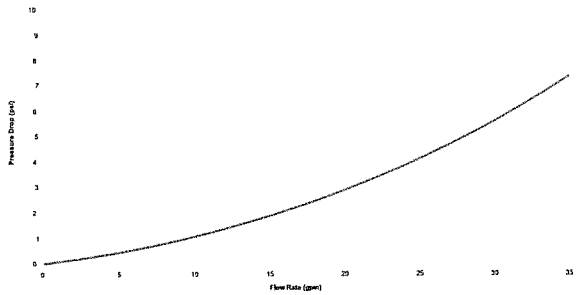
HEADLOSS CURVES



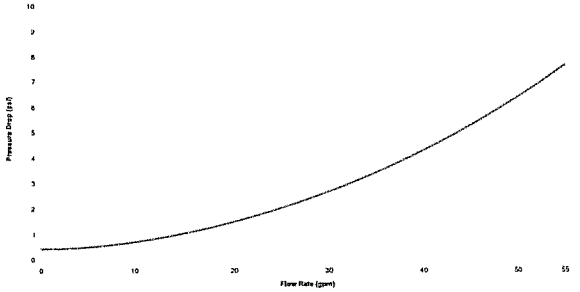
5/8" Headloss Curve



3/4" Short Headloss Curve



3/4" Headloss Curve



1" Headloss Curve

SENSUS
The Measure of the Future

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T: 1-800-638-3748
F: 1-800-888-2403
www.sensus.com/water
h2oinfo@sensus.com

RadioRead+

SmartPoint™

Model 520P – Pit Set

DESCRIPTION

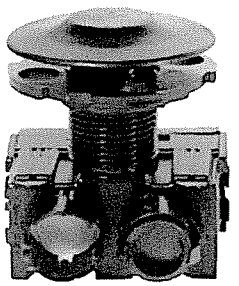
Application: The RadioRead+ 520P SmartPoint is a high-power walk-by/drive-by radio transmitter that provides water meter and ancillary device data from equipment located in meter pit environments. The RadioRead+ SmartPoint is submersible and designed to withstand harsh underground environments.

TouchCoupler Design: The RadioRead+ SmartPoint utilizes TouchCoupler, the patented Sensus Inductive coupling communication system, to interface with the meter encoder as well as other devices. With TouchCoupler, the SmartPoint can connect to the meter using existing two wire AMR installations instead of requiring utilities to access the home to install a new three wire system, resulting in a fast, efficient and reliable connection with minimal cost– still the easiest upgrade process in the marketplace.

Operation: The RadioRead+ SmartPoint receives input from the meter register and stores up to 35 days of hourly usage data, while awaiting an interrogation signal from a reading device. When a reading request signal issued by a Vehicle Gateway Basestation (VGB) or Hand-Held reading unit (HHD), the SmartPoint transmits the most recently stored reading, the meter identification number and any alarms. Detailed hourly usage can be withdrawn from the device using a Hand-Held reading unit.

The RadioRead+ SmartPoint broadcasts at two full watts of power on FCC primary licensed, exclusive-use (unshared) radio spectrum.

Additional SmartPoint M2 Features: The SmartPoint M2 obtains hourly readings and can monitor continuous flow over a programmable period of time, alerting the meter reader to potential leak situations. In addition, the RadioRead+ SmartPoint stores up to 840 consumption intervals (35 days of hourly consumption), providing the utility with the ability to extract detailed customer usage profiles for reliable information and quick dispute resolution. The RadioRead+ SmartPoint also incorporates a two port design, allowing the utility to connect multiple registers to a single SmartPoint for a compact installation that saves space, time and money. What's more, SmartPoints are easily configured to accept and transmit data from ancillary devices such as acoustic monitoring applications without reducing system performance.



SPECIFICATIONS

SERVICE	Pit set installation interfacing the utility meter to the Sensus RadioRead+ system. Unit requires 1.75" diameter hole in pit lid; fits pit lid thicknesses up to 1.75"
PHYSICAL CHARACTERISTICS	Width: 4.43" x Height: 5.09" x Depth: 3"
WEIGHT	1.0 lbs/16.0 oz
COLOR	Black
FREQUENCY RANGE	900 – 950 MHz, 8000 channels X 6.25 kHz steps
MODULATION	Proprietary Narrow Band
MEMORY	Non-Volatile
POWER	Lithium Thionyl Chloride batteries in conjunction with a hybrid layer capacitor (HLC)
APPROVALS	
US:	FCC CFR 47: Part 90, Part 24D, Part 101C, Part 15 Licensed operation
Canada:	Industry Canada (IC) RSS-134, RSS-119, RSS-210
OPERATING TEMPERATURE	- 22° F to +185° F *- 30° C to + 85° C*
OPTIONS	Dual or single port availability; TouchCoupler only, wired only.
INSTALLATION ENVIRONMENT	100% condensing, water submersible
COMPATIBILITY	**TouchCoupler and Wired Version:** Sensus ECRII, ICE and Badger ADE water registers **Wired Version Only:** Elster Encoder (Sensus protocol) and Neptune ARB VI (ProRead).
WARRANTY	20 years Refer to Sensus G-500 for warranty.

SENSUS

P.O. Box 487 | 450 North Gallatin Avenue
Uniontown, PA 15401 USA
T: 1-800-638-3748
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www.sensus.com/water
h2oinfo@sensus.com

FlexNet

Vehicle Gateway Basestation VGB

APPLICATION

The Sensus FlexNet Vehicle Gateway Basestation (VGB) is a portable radio-based device used for the acquisition of data from utility meters and other field-based diagnostic instuments. The VGB is compact and portable, allowing it to be used in any vehicle providing 12-volt DC power. The operator simply places the unit in the vehicle cabin, loads the desired meter reading route into the laptop computer and drives along the prescribed route. Meter data is collected as the vehicle travels within proximity to the selected meters. The complete VGB package includes everything needed to read meters and ancillary (such as acoustic monitoring) devices that are equipped with FlexNet M2 or RadioRead+ SmartPoints.

OPERATION

The VGB sends an alert signal to the meter SmartPoint or ancilary device. Upon receipt of the alert, the SmartPoint responds by transmitting its most recent reading. Once received, the SmartPoint returns to a low-power listening mode. The operator has the option of directing the VGB to signal all endpoints within range (blind reading mode), or to select endpoints (geographic reading mode).

SYSTEM RELIABILITY

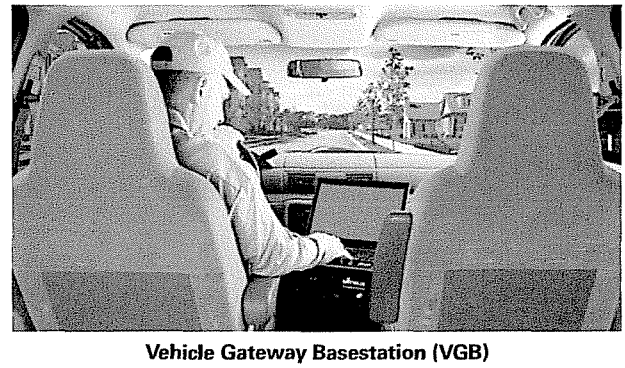
FlexNet and RadioRead+ utilize primary-use radio frequencies to communicate with SmartPoints. The combination of FCC-protected frequencies and shear transmission power of the SmartPoints ensure reliable communication from meters and ancillary devices. What's more, SmartPoint M2 and RadioRead+ SmartPoints provide infrastructure detail by monitoring their operating conditions and reporting meter tamper, continuous flow, leak detection (when equipped), high or low consumption and low battery alarms.

PORTABILITY

Through the use of advanced design, the radio electronics of the VGB are contained in a portable enclosure about the size of a small briefcase. With the addition of a laptop computer, connecting cables and antenna, the complete VGB package can be set up in any vehicle within minutes. The compact, portable VGB instantly turns almost any vehicle – even a compact car – into a meter reading machine.

SPECIFICATIONS

SERVICE	Radio-based mobile utility meter reading system
PHYSICAL CHARACTERISTICS	VGB in metal case with folding handle: Length: 14.5" x Width: 11.25" x Height: 5". Includes Laptop computer, USB cables, magnetic-mount antenna and hard shell carrying case.
WEIGHT	15.2 lbs. (6.8 kg)
POWER	12-volt DCDC adapter through VGB (with battery back-up; computer only)
COMMUNICATIONS	900-950 Mhz.
MEMORY	Non-Volatile
APPROVALS	Licensed Operation
US:	FCC CFR 47, Part 24D, Part 101C, Part 15
CANADA:	Industry Canada (IC) RSS-134, RSS-210



Vehicle Gateway Basestation (VGB)

USER FRIENDLY SOFTWARE

The VGB utilizes AutoVu, a software program especially designed for operating Sensus drive-by meter reading equipment. AutoVu features a convenient, user-friendly pull-down menu system for directing the meter reading process. Operators are also able to input information, such as route notes, manually via the PC's keyboard. The operator can also easily edit route data configurations when necessary. Back at the office, Sensus AutoRead processes the information gathered by AutoVu and provides the utility's billing software with a simple plug-and-play interface, no matter what Sensus reading system is utilized.

SENSUS SYSTEMS MAKE READING UTILITY METERS FAST, EASY AND RELIABLE

Our user-focused equipment and software provides utilities with tremendous meter reading efficiency, with fewer limitations compared to other types of radio-based meter reading systems. And because our software platforms operate with all of our reading packages, utilities can transition systems without downtime for operator training. Discover the power of Sensus, the measure of the future.

AUTHORIZED SENSUS DISTRIBUTOR

SENSUS

P.O. Box 487 | 450 North Gallatin Avenue
Uniontown, PA 15401 USA
T: 1-800-638-3748
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The C.I. Thornburg Co., Inc

P.O. Box 2163 · Huntington, WV 25722
4034 Altizer Avenue · Huntington, WV 25705
(304) 523-3484 · FAX (304) 523-0510

1st Bid

Date: 6/28/2009

To: Mullenburg Co. Water District

Re: Sensus Automated Meter Reading

Gentlemen,
We are pleased to propose the following for the above referenced project

Item:	Qty	Item Description	Unit Price
		New Residential Water Meter	
	6200	5/8" x 3/4" SRII Water Meter w/Plastic Bonnet & Bottom,	$98.00
		Sensus Radio Transceiver Unit	
	6200	520R Single Port Radio Transmitter (1 meter per radio)	$103.00
	1	520R Dual Port Radio Transmitter (2 meters per radio)	$120.00
		Sensus Automated Meter Reading Equipment	
	2	Complete Meter Reading Package to Include:	$18,000.00
	2	Vehicle Transceiver Unit (VXU) w/ High Gain Antenna & Case	
	2	Dell Laptop Computer with RadioRead® Software, Mapping Module and GPS Receiver	
	1	AutoRead® Software	
	1	AR 5502 RadioRead Handheld Device with Charging Stand	
	1	AR 4094 PitProbe with Extension	
	1	2 day Training and Installation Package	$2,500.00
		Sensus Omni Commercial / Industrial Meter	
	1	1.5" Omni T^2 Meter, SCADA and AMR Ready	$711.71
	1	2" Omni T^2 Meter, SCADA and AMR Ready	$844.22
	1	3" Omni T^2 Meter, SCADA and AMR Ready	$1,051.99
	1	4" Omni T^2 Meter, SCADA and AMR Ready	$2,048.07
	1	6" Omni T^2 Meter, SCADA and AMR Ready	$3,687.20
		Meter Installation	
	6200	Installation labor per meter setting	$35.00

Total (residential meters, radios, reading equipment and installation)

Notes:

Quoted pricing is for budgetary purposes and exact quantities are to be determined by the customer.

shipment beyond this timetable MAY escalate prices.

Total Price

$607,600.00

$638,600.00
$120.00

$36,000.00

$2,500.00

$711.71
$844.22
$1,051.99
$2,048.07
$3,687.20

$217,000.00

$1,499,200.00

The C. I. Thornburg Co., Inc.

740 Enterprise Drive - Lexington, KY 40510
(859) 255-0852 - FAX (859) 259-1171

Date: July 11, 2012

To: Muhlenburg County #1

Re: Sensus Drive-by Meter Upgrade

Ladies and Gentleman,
We are pleased to propose the following material for the above referenced project:

BID ITEM	BID QTY.	DESCRIPTION	UNIT PRICE		TOTAL PRICE
		Sensus Drive-By Reading Equipment			
	1	Vehicle Base Station Transceiver w/ Magnetic Antenna			
	1	Sensus 5502 Handheld Reader & Programming Device			
	1	Laptop Computer w/ Cables, & AutoVu Software			
	1	Mapping module for Drive-By Application			
	1	Installation and Start-up Services by CITCO			
		package total	28,000.00	$	28,000.00
		Sensus Radio Transmitters			
	1-500	Sensus 520P Radio Unit, Single Port	112.00		
	501+	Sensus 520P Radio Unit, Single Port	107.50		
	1-500	Sensus 520P Radio Unit, Dual Port	125.00		
	501+	Sensus 520P Radio Unit, Dual Port	121.00		
		Sensus Water Meters			
	1+	5/8" x 3/4" Sensus SRII Water Meter	108.00		
	1+	5/8" x 3/4" Sensus SRII Water Meter (SLP Program pricing)	92.00		
	0-1000	5/8" x 3/4" Sensus iPERL Water Meter (Composite Intelligent Meter)	120.00		
	1001+	5/8" x 3/4" Sensus iPERL Water Meter (Composite Intelligent Meter)	116.00		
		Complete Drive-By System w/ SRII meters, radios & equipment			
	5,700	Sensus 520P Radio Unit, Single Port	112.00	$	638,400.00
	0	Sensus 520P Radio Unit, Dual Port	117.00	$	-
	1	Drive-By reading Equipment Package*	28,000.00	$	28,000.00
	5,700	5/8" x 3/4" Sensus SRII Water Meter	108.00	$	615,600.00
			Total	**$**	**1,282,000.00**
			Total less reading equipment	**$**	**1,254,000.00**

Sensus Loyalty Program (requires trade in of existing sensus meter)

Sensus Loyalty Program (requires trade in of existing sensus meter)

Complete Drive-By System w/ SRII meters, radios & equipment

5,700	Sensus 520P Radio Unit, Single Port	112.00	$	638,400.00
0	Sensus 520P Radio Unit, Dual Port	117.00	$	-
1	Drive-By reading Equipment Package*	28,000.00	$	28,000.00
5,700	5/8" x 3/4" Sensus SRII Water Meter	92.00	$	524,400.00
		Total	**$**	**1,190,800.00**
		Total less reading equipment	**$**	**1,162,800.00**

Complete Drive-By System w/ iPERL meters, radios & equipment

5,700	Sensus 520P Radio Unit, Single Port	112.00	$	638,400.00
0	Sensus 520P Radio Unit, Dual Port	117.00	$	-
1	Drive-By reading Equipment Package*	28,000.00	$	28,000.00
5,700	5/8" x 3/4" Sensus iPERL Water Meter (Composite Intelligent Meter)	120.00	$	684,000.00
		Total	**$**	**1,350,400.00**
		Total less reading equipment	**$**	**1,322,400.00**

* *Drive-by reading equipment may have $0 cost if a complete system commitment is made for the above quantitie.*

Notes: System pricing based upon utility estimated quantities and may be subject to change. Package price is based upon full quantity release and prices are firm through December 2012.
After december 31, 2012 only low-lead alloy meters will be available and current SRII pricing will no longer be valid

* **Quantities of Field Verified Items not included in proposed total.** *

* **All materials & quantities must be verified as correct by the contractor.** *

Payment Terms: Net 30 days.
FOB Terms: Jobsite.
Taxes: Prices quoted are excluding any applicable taxes.
Submittals and drawings: Prices include any required submittal drawings, and blueprint construction drawings at NO CHARGE.

We appreciate the opportunity to provide you with this quotation, and hope we may be favored with your valued business.

Sincerely,

THE C. I. THORNBURG CO., INC.

Jeremy McComas
Sales Engineer

The C.I. Thornburg Co., Inc.

P.O. Box 2163 · Huntington, WV 25722
4034 Altizer Avenue · Huntington, WV 25705
(304) 523-3484 · FAX (304) 523-0510

3

last Bid

Date: 6/4/2009 2012

To: Mullenburg Co. Water District

Re: Sensus Automated Meter Reading

Gentlemen,
We are pleased to propose the following for the above referenced project

Item:	Qty	Item Description	Unit Price	Total Price
		New Residential Water Meter		
	1	5/8" x 3/4" SRII Water Meter w/Plastic Bonnet & Bottom,	$100.00	$100.00
		Sensus Radio Transceiver Unit		
	1	520R Single Port Radio Transmitter (1 meter per radio)	$105.00	$105.00
	1	520R Dual Port Radio Transmitter (2 meters per radio)	$120.00	$120.00
		Sensus Automated Meter Reading Equipment		
	1	Complete Meter Reading Package to Include:	$18,000.00	$18,000.00
	1	Vehicle Transceiver Unit (VXU) w/ High Gain Antenna & Case		
	1	Dell Laptop Computer with RadioRead® Software, Mapping Module and GPS Reciever		
	1	AutoRead® Software		
	1	AR 5002 RadioRead Handheld Device with Charging Stand		
	1	AR 4090 PitProbe with Extention		
	1	2 day Training and Installation Package	$2,500.00	$2,500.00
		Sensus Omni Commercial / Industrial Meter		
	1	1.5" Omni T^2 Meter, SCADA and AMR Ready	$711.71	$711.71
	1	2" Omni T^2 Meter, SCADA and AMR Ready	$844.22	$844.22
	1	3" Omni T^2 Meter, SCADA and AMR Ready	$1,051.99	$1,051.99
	1	4" Omni T^2 Meter, SCADA and AMR Ready	$2,048.07	$2,048.07
	1	6" Omni T^2 Meter, SCADA and AMR Ready	$3,687.20	$3,687.20

Notes:

Quoted pricing is for budgetary purposes and exact quantities are to be determined by the customer.

shipment beyond this timetable MAY escalate prices.

Payment Terms: Net 30 days.
FOB Terms: Jobsite.

	Complete Drive-By System w/ SRII meters, radios & equipment			
5,700	Sensus 520P Radio Unit, Single Port	112.00	$	638,400.00
0	Sensus 520P Radio Unit, Dual Port	117.00	$	-
1	Drive-By reading Equipment Package*	28,000.00	$	28,000.00
5,700	5/8" x 3/4" Sensus SRII Water Meter	92.00	$	524,400.00
		Total	**$**	**1,190,800.00**
		Total less reading equipment	**$**	**1,162,800.00**

Below system prcing only vaild for complete quntity order by january 31st, 2013

	Complete Drive-By System w/ iPERL meters, radios & equipment			
5,800	Sensus 520P Radio Unit, Single Port	105.00	$	609,000.00
0	Sensus 520P Radio Unit, Dual Port	117.00	$	-
1	Drive-By reading Equipment Package*	0.00	$	-
5,800	5/8" x 3/4" Sensus iPERL Water Meter (Composite Intelligent Meter)	110.00	$	638,000.00
		Total	**$**	**1,247,000.00**
		Total less reading equipment	**$**	**1,247,000.00**

* *Drive-by reading equipment may have $0 cost if a complete system commitment is made for the above quantitie.*

Notes: System pricing based upon utility estimated quantities and may be subject to change. Package price is based upon full quantity release and prices are firm through December 2012.
After december 31, 2012 only low-lead alloy meters will be available and current SRII pricing will no longer be valid

* **Quantities of Field Verified Items not included in proposed total.** *

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Sincerely,
THE C. I. THORNBURG CO., INC.

Jeremy McComas
Sales Engineer

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Sincerely,
Jeremy McComas
Sales Engineer
THE C. I. THORNBURG CO., INC.